

XLI. — *A remarkable Cysticercus from a rare Dolphin* (Cysticercus *Tæniæ* Grimaldii, Moniez, 1889). By H. A. BAYLIS, M.A.

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IN May 1917 a specimen of the rare dolphin *Lagenorhynchus acutus* was stranded at Skegness, on the Lincolnshire coast. It was sent to the British Museum (Natural History), and during its dissection by Mr. W. P. Pycraft there were found under the peritoneum large numbers of cysts. These contained blood-stained fluid, and in each of them, lying free in the fluid, was what appeared to be a *Cysticercus*. In some cases there were also two or three hard calcareous concretions in the fluid, and in one cyst the fluid was milky and opaque.

A number of the cysticerci were carefully preserved by Dr. W. T. Calman, to whom I am indebted for the foregoing details of information. Dr. Calman also observed that on removal from the host (which had been dead at least eleven days) the worms still showed signs of life, and "responded by feeble but quite distinct contractions when prodded with a needle."

The worm appears to be identical with a form described by Moniez (1889) under the name of "*Cysticercus Tæniæ Grimaldii*"\*, the sexually mature form of which is unknown. Although Moniez observed the most striking feature of the animal—viz., its long neck—he does not describe the anatomy very fully, and gives no account of the important characters of the scolex. Further, no figures of this remarkable form are given. It is thought worth while, therefore, to give here a somewhat fuller description, including some account of the scolex, which has features of systematic value.

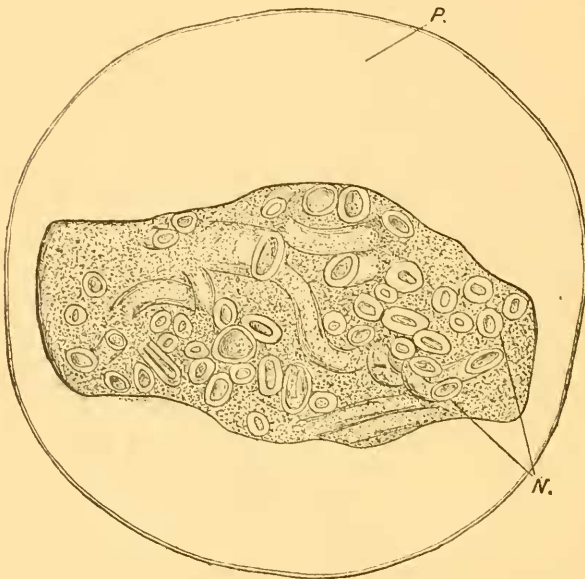
#### ANATOMY.

The cysticerci are yellowish-white in colour (in spirit) and are of very variable size and shape. The length varies from about 8 to 25 mm., according to age and state of contraction.

\* The *Cysticercus Tæniæ Grimaldii* is apparently closely similar to, if not identical with, *Stenotænia delphini*, Gervais, 1870; from this author's description it appears that he took the "neck" to be the worm itself, and the bladder of the cysticercus to be a second cyst containing it.

On the whole, the general form may be described as an elongate pear-shape, the narrower end being that at which the invagination takes place for the formation of the scolex. Frequently the "bladder" is somewhat flattened and pushed in on one side, so that the animal is then convex on one surface and concave on the other. The "anterior" end, or that at which invagination takes place, is often suddenly narrowed, forming a rather proboscis-like projection. The

Fig. 1.



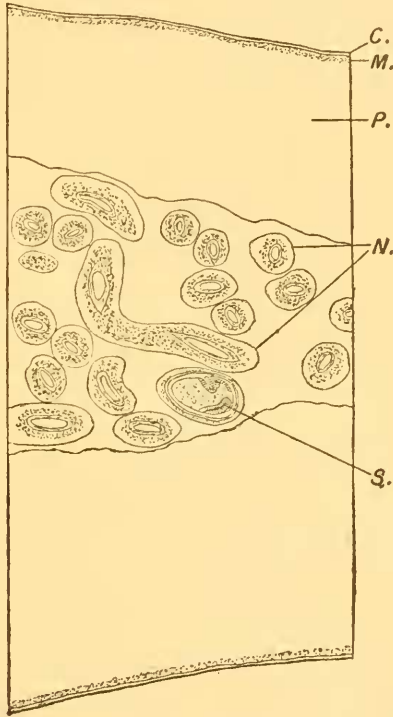
"*Cysticercus Tænie Grimaldii*." View of the animal cut through transversely at about the middle. Much magnified.

N., coils of the "neck" cut across in various directions; P., parenchyme of the "bladder."

wall of the bladder is firm in consistency, but cuts very easily. On opening a specimen, the wall is found to be very thick on two sides and comparatively thin on the other two (fig. 1, P.). The appearance of a small specimen on being thus opened is much like that of the well-known forms of *Cysticercus*, such as *C. pisiformis*, except as regards the

unusual thickness of the wall of the bladder. The larger specimens, however, show a very remarkable structure. The cavity of the bladder is almost entirely filled by an enormously long coiled tube, which on further investigation is

Fig. 2.



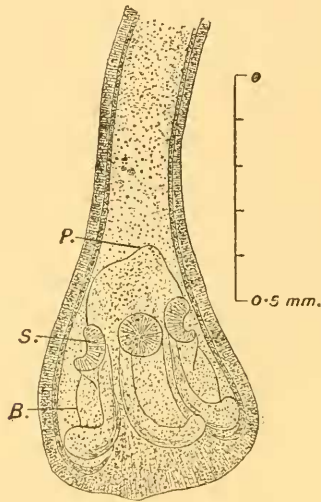
"*Cysticercus Tæniæ Grimaldii*." Portion of a transverse section near the hinder end, passing through the scolex.

C., cuticle; M., muscle-layers; N., coils of the "neck" cut across; P., parenchyme of the "bladder"; S., scolex.

found to be continuous at one end with the wall of the bladder at the point of invagination, and at the other end by careful search may be seen to end blindly in a slight bulbous expansion which contains a scolex. The tube, in fact, is

simply an extraordinarily elongated "neck," precociously developed within the bladder of the cysticercus. The coils of this tube run in various directions (figs. 1 & 2, *N.*), but in the main antero-posteriorly. After fixation of the worm it is impossible to straighten out this neck for the purpose of measuring it; but Moniez calculated that in one moderate-sized specimen examined by him it measured 65 centimetres, and the length was probably greater still in larger specimens. It must, at all events, be many inches in length.

Fig. 3.



"*Cysticercus Tenia Grimaldii.*" The scolex, as seen by transparency within the swollen blind end of the "neck."

*B.*, bothridium; *P.*, terminal papilla; *S.*, accessory sucker.

The structure of the scolex (fig. 2, *S.*, & fig. 3) is especially important. Moniez dismisses it with the statement that it is provided with four suckers and destitute of hooks. In reality, however, its suckers deserve special attention. They are, strictly, "bothridia" of the type seen in certain Cestodes of the family Phyllobothriidæ—*i. e.*, they have the form of elongated flaps (fig. 3, *B.*) attached to the scolex at their anterior ends and hanging freely posteriorly. Their edges are slightly curled inwards at the sides and behind,

forming a shallow cup. At the anterior end of each bothridium there is a small rounded muscular "accessory sucker" (fig. 3, *S.*). The apex of the scolex bears a slight papilla ("myzorhynchus") (fig. 3, *P.*), but there are no hooks of any kind. The scolex measures about 0.5 mm. in length and about 0.25 mm. in width at the level of the accessory suckers. The bothridia, including the accessory suckers, are about 0.3 mm. long, the diameter of the accessory suckers themselves being 0.1 mm. The neck, in a well-advanced specimen, measures 0.2 mm. in thickness and is of very nearly the same diameter throughout its length, though slightly widened here and there.

The histological structure of the animal presents some features of interest. The wall of the external "bladder," as has been mentioned, is greatly thickened, especially on two opposite sides. The groundwork of this thick envelope consists of loose parenchymatous tissue, with a few scattered muscle-fibres. There is a slight concentration of these towards the periphery, as seen in transverse sections, forming a vague circular layer. Externally the surface is covered with a delicate cuticle, immediately below which there is a thin coat of circular muscle-fibres, followed again by a thin coat of longitudinal muscles.

The parenchyme is densely crowded with calcareous bodies, showing the usual concentric structure. In addition to these there are immense numbers of fat-cells, each enclosing a large globule of fat. This fat is so abundant that it at first hindered the preparation of satisfactory serial sections, as it was found that a layer of it, partially dissolved out of the tissues by the xylol used in the process, was formed round the object when embedded in paraffin in the usual way. This difficulty was found to be easily overcome by a short immersion in ether before clearing. The fat-cells were very beautifully demonstrated by staining thin shavings of the parenchyme with Sudan III. and mounting in glycerine.

The parenchyme of the bladder-wall also contains numerous branching excretory vessels with delicate walls. These empty eventually into a wide and sinuous excretory canal, opening to the exterior by a minute pore at the posterior end of the bladder. This pore is, in some cases, just visible to the naked eye.

The structure of the long "neck" shows the same layers as have been described for the bladder, but in the reverse order, and they may be seen to pass over from one to the

other at the invagination. Thus the neck is lined by a thin cuticle, which is followed by two layers of muscles—the inner coat circular, the outer longitudinal. Outside the longitudinal muscles there is a coat of parenchymatous tissue, with very densely crowded nuclei on the inner side. The outer boundary of this layer, like the inner boundary of the wall of the bladder, is vaguely defined, and the parenchyme-cells seem to be bathed in the fluid contained in the bladder, which in the fixed material has become coagulated into a flocculent mass, containing numerous refringent granules.

#### SYSTEMATIC POSITION.

The structure of the scolex enables the affinities of this larval form to be decided with some precision. It may be assigned definitely to the genus *Monorygma*, Diesing, 1863, of the family Phyllobothriidæ. The question therefore arises whether it can be specifically determined. The worms of this genus, of which six species appear to have been described up to the present, are all parasitic, in their sexual stage, in sharks and dogfish.

The six known species are the following:—

1. *M. perfectum* (van Beneden, 1853) [*Anthobothrium perfectum*].  
Host: *Læmargus borealis*.
2. *M. gracile* (Olsson, 1869) [*Trilocularia gracilis*].  
Host: *Acanthias vulgaris*.
3. *M. elegans*, Monticelli, 1890 [originally described by Zschokke, 1889, under the name of *Monorygma perfectum*, Diesing].  
Hosts: *Scyllium catulus* and *S. stellare*.
4. *M. chlamydoselachi*, Lönnberg, 1893.  
Host: *Chlamydoselachus anguineus*.
5. *M. dentatum*, v. Liustow, 1907.  
Host: a shark (Antarctic) of unknown determination.
6. *M. rotundum*, Klaptocz, 1907.  
Host: *Notidanus* [*Hexanchus*] *griseus*.

As regards the dimensions of the scolex, the present form seems to approach most closely to *M. elegans*, which has been fairly fully described by both Zschokke\* (1889) and de Beauchamp (1905). The length of the scolex in this form is given by Zschokke as 0.4 mm.-0.8 mm., the width of the scolex as 0.3 mm.-0.4 mm., and the width of the neck as 0.1 mm.-0.25 mm. The other measurements given by both authors agree fairly well with those given above for the cysticercus.

There has been some confusion between *M. perfectum* (van Beneden) and *M. elegans*, but on comparing the original descriptions it seems highly probable, as Monticelli (1890, p. 434, footnote) and de Beauchamp (1905) contend, that the two forms are distinct. *M. elegans*, according to de Beauchamp, is 17 or 18 cm. in length, while *M. perfectum* reaches 30 to 40 cm. (van Beneden, 1853, 1861) or 12 to 15 inches (Diesing, 1863). The scolex is also very much larger in *M. perfectum*, measuring, according to van Beneden, 1-2 mm. in width, while Diesing gives it as  $\frac{1}{2}$ -1<sup>m</sup>. *M. perfectum* would appear therefore to be a considerably larger form altogether than *M. elegans*.

#### LIFE-HISTORY.

It would have been extremely interesting if the cysticercus under discussion could have been shown to belong to *Monorhynchus perfectum*, since, as Dr. S. F. Harmer informs me, the host of this species, the Greenland shark (*Læmargus borealis*) has the habit of biting out pieces of the flesh of living Cetacea, and this would have afforded a satisfying account of the life-history of the parasite. If *M. elegans* and *M. perfectum* were shown to be identical, greater plausibility might be lent to this hypothesis. For the present, however, it seems impossible to assign the cysticercus definitely to any of the species. It may very possibly be that of *M. elegans*, which is parasitic in *Scyllium* spp., and to which species, as has been seen, it approaches closely in the size and structure of the scolex. We have also to remember the somewhat remarkable fact that the cysticerci can remain alive for at least eleven days after the death of the host, and even after its removal from the water. Hence they may very well be swallowed by any species of dogfish that devours pieces of dead dolphins containing the cysts.

\* Zschokke describes it under the name of *M. perfectum*, Dies.

As regards the long neck of the cysticercus, it would appear to be one of those apparently useless structures so frequently met with in the animal kingdom, of which no satisfactory explanation is forthcoming. As Moniez remarks: "Tout ce développement se fait en pure perte, car il est bien impossible que la tête du *Ténia* puisse se dévagner." In all probability all but the portion surrounding the scolex is thrown off and lost when the animal finds its way into its final host.

The host of the *Cysticercus Tænie Grimaldii*, Moniez, though its specific name is not given, would appear to have been the common dolphin (*Delphinus delphis*), as was also the host of Gervais's *Stenotenia delphini*. The worm is now recorded for the first time in *Lagenorhynchus*.

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